DATA PROCESSING DIGEST

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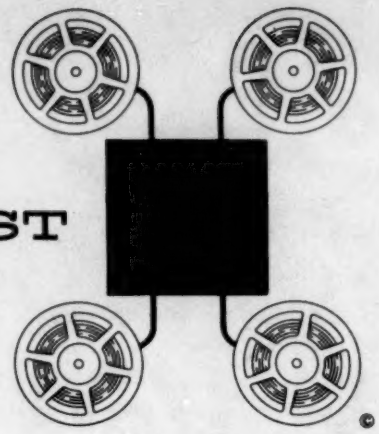

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General Information

THE NATURE OF COMPUTER CONTROL

George M. Perry, The Travelers Insurance Co.
INTERNAL AUDITOR, December 1959; pages 29-33.

There are three kinds of controls in any EDP system which will insure error-free data. These are: logic and accounting controls, machine circuitry controls, and internal operational controls. The logic and accounting controls are an integral part of the job definition, and each program includes controls which are designed for its specific needs. Accounting controls guarantee accurate input. Control over internal processing is shared by program logic, machine circuitry, and operational controls.

In translating a system from a manual to an electronic system, the auditor must examine the logic of the manual system's controls. Simply transferring these controls to the computer may become redundant, or ineffectual. The computer may need controls which are not apparent in a manual system.

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Machine circuitry controls are the task of the manufacturer of the equipment. These consist not only of safeguards against machine failure, but also detection of errors that do occur. The most universally used machine circuit control is the parity check. Others are the "echo" check, used at critical transfer points; dual arithmetic; and dual recording on tape. Input and output devices also contain checking characteristics.

Operational controls must be standardized to be effective. That is, they must operate in the same manner for all jobs. They can guarantee accurate scheduling, tape assignment and handling, and manual computer operation. Some controls used by the author's company are:

Tape header message. This is a label on each tape which identifies the reel by its number, and includes a usage count, and current and minimum release dates.

Rollback and reposition. This is a routine designed to provide restart points that assure that all prior processing is correct and intact. The rollback routine creates a breakpoint whenever a tape is exhausted and a new tape is to be connected. At the breakpoint, the status of each tape is recorded as well as the contents of the entire memory.

Message count. This control guarantees that information to be recorded on a tape by the computer actually reaches the tape. Any tape created by the computer for its subsequent use must contain a total count of the messages at the end of the tape. Also, when a tape is read into the computer, the messages are counted and the total compared to the count message at the end of the tape.

A COMPUTER'S POTENTIAL

BANKING, December 1959; pages 38-39.

Edward T. Shipley, comptroller and auditor of Wachovia Bank & Trust Company, Winston-Salem, N. C., believes that a computer may be of greater value in the auditing function than in general accounting operations of banks, because it "can develop heretofore unavailable information of interest to management," such as "analysis of trends in deposit accounts by types of industry..... forecasting of loan trends and money positions...."

"Proper use of the equipment will permit the preparation of trial balances electronically, the computation of ratios and percentages at maximum speeds, and even the preparation and proof of direct verification media, with little or no human intervention.

Audit can be by-product of transaction processing

"The continuous audit of transactions within the loan department can be performed as a by-product of the maintenance of the accrual of income on these notes through the use of this hardware. Payroll accounting and auditing can be combined in one well-prepared program for the computer. The review of many phases of the instalment loan operation can be incorporated in the regular accounting program for that job."

Programs may be designed specifically for the audit function. "The equipment would scan the recorded data and call the auditor's attention to any exceptions or variations from predetermined and previously approved accounting methods and results." Under such a system, there would be an audit by exception. Controls presently applied could be maintained in the source document preparation, which is the area of greatest vulnerability in an automated system. For example: "operations such as instalment or mortgage loan accounting provide an opportunity where the computer may prepare the source documents in advance of the transaction, thus providing another chance for 'audit by exception.' 'With this control, we can deliver to the data processing center the data for the updating of records with figures, against which the journals must balance. The principle involved is the same we have always applied.'"

"OPERATION TRANSITION"—A BIG STEP FOR PACIFIC POWER & LIGHT

MANAGEMENT AND BUSINESS AUTOMATION, November 1959; pages 22-26.

Pacific Power & Light of Portland, Oregon, serves about 300,000 customers in five Northwestern States. Although it had placed its customer billing operations on key-driven equipment in 1948, it began to plan for an electronic system three years later. The new system was built "from the ground up." New, streamlined procedures were designed from field operations through the central office.

New system is a one-pass operation

Since there were no tab procedures to cloud the picture, the system was begun as a one-pass operation. The computer bills customers, and updates their records by processing connect and disconnect orders, local bills, cash payments, adjustments and data changes--all in one pass. These and other transactions, including mark-sensed meter reading cards, are translated into punched cards, then sequenced for processing by the computer. Accounts maintained in account number sequence on magnetic tape are updated by the one-pass operation.

Other by-products include posting of all debits and credits, producing trial balances, updating arrears and accumulating revenue statistics. Billing cards and accounts receivable listings are output from the "bread and butter" customer accounting program, which uses the system 11 hours a day, five days a week. The billing cards are merged off-line with the name and address of the various accounts. Final and regular customer bills, suspension notices and final bill follow-up are also produced off-line.

The meter books were translated into 400,000 punched cards over a 17-month period. The gradual, step-by-step program included training of personnel before attempting to move on to the next office's conversion. The Burroughs 205 was installed in a new wing at the company's Portland building, which was designed and equipped especially for the computing center.

Employees qualified through aptitude tests

One hundred interested employees took a battery of tests provided by Stanford Research Institute. Twelve of these were chosen to form the nucleus of the EDP staff. Only one of these had extensive experience in customer accounting; another had a strong academic background in mathematics. After a 6-week training course, the group began flow charting and programing. Pacific Power & Light is now working on a two-pass payroll program covering 2400 employees over five states. The program will have to adjust to the varying income tax, industrial insurance, medical aid programs and other requirements of the five areas. Account distribution will be an automatic by-product of the semi-monthly pay run.

The computer is being used 88 hours each month on engineering problems. The combined accounting and engineering time has amounted to 17 hours a day.

A PROGRAM FOR SELECTING DATA PROCESSING PERSONNEL

Deborah L. Blumer, Herbert Halbrecht Associates, Chicago
MANAGEMENT AND BUSINESS AUTOMATION, December 1959; pages 16-19, 32.

Best source of personnel is the present employees

In selecting personnel for an EDP system, "there is growing evidence that most of the technical personnel needed--including those who can be trained within the time limits of the automatic changeover--may be found within the firm's existing employe group."

A procedure for locating this talent is suggested. The first step is to find out who is interested by announcing the entire automation plan to all employees, and offering them the opportunity to participate in the development of the data processing group. Second, present a two- or three-week educational program as an introduction to the concepts of the new system. Third, offer an advanced course which goes into technical details of the system. Those with the highest degree of interest and promise will be the most likely candidates for the data processing staff. Other tentative selections should be made on recommendations of supervisors of all departments.

Finally, use a combination of specialized psychological tests and personal interviews to find those employees who would contribute most to the program. Avoid wholesale testing, but give the tests to those who really want the chance to participate as well as those whom the screening process indicated are the best bets. Two representative tests are included in the article, one which tests an aspect of mechanical aptitude, the other abstract reasoning qualities. Tests should never be considered the final answer, or used to relieve management of its decision-making responsibilities. But they are useful in assessing those qualities that are most difficult to measure in the interview.

Interpretation of test results should not be kept secret from the people who took them. However, management does not need to know, and should not know, the test results of each individual. Management does need to know who has shown the greatest suitability for the jobs, for this information will be important in making the best placement decisions.

OFFICE AUTOMATION AND WHITE COLLAR EMPLOYMENT, BULL. #6

Georgina M. Smith
Published by Institute of Management and Labor Relations, Rutgers, The State University, New Brunswick, New Jersey

After a review of the development of computers for business purposes, the author examines the effect of automation on clerical personnel and employment. The real problem may be the not-hired group, those who cannot go into clerical positions because of the reduction of available jobs caused by electronic methods. This group includes

Post high school training provided only by industry and government

girls just out of high school and older women. These people will have two possible alternatives: get additional training to suit them for jobs in an automated office, or go into a service type of job such as selling.

At the present time there is little information or activity on the high school level to prepare people for jobs in automated offices. What little is being done is by private industry, such as the Bank of America, and by the government. By 1965 there will be an estimated need for 170,000 programers and operators, and 50,000 maintenance specialists.

Office jobs may take on a new look. For example, round-the-clock shifts in computer centers may require a change in state labor laws regarding women. Office unionism may appear more widespread, however some sources believe automation may impede unionization because those who have survived automation will be better paid as a result of the change. In the long run, however, the effect of computers on total white collar employment will depend almost exclusively on the state of the national economy; rapid expansion of business activity could continue to swell total white collar employment while the change in its make-up takes place.

THE DEMAND FOR COLLEGE TRAINING IN DIGITAL COMPUTING

Frank R. Hartman, Pennsylvania State University
COMPUTERS AND AUTOMATION, November 1959; pages 11-14.

A survey of companies who normally recruit Penn State graduates was made to "ascertain how computing facilities are distributed in industry and to assess the resulting need for computer training of college graduates." Results showed that the outstanding curricula preferences are accounting and mathematics, with physics, business administration, electrical, industrial and chemical engineering following. The heavy demand appeared to be for training at a level of easy familiarity with computers but not of specialized sophistication.

The surveyors estimated from the answers to their survey that for the year 1970 there will be among the surveyed companies 4641 computing job vacancies, of which one-fourth would be for electrical engineers.

CAREER PATHS IN AUTOMATIC DATA PROCESSING

A. D. Palley
AUTOMATIC DATA PROCESSING, November 1959; pages 9-11.

The American author of this article, reporting on a recent survey he made of British computer users, found that most of the companies he had visited were forced to look outside their company for the necessary talent to manage their EDP systems. He believes the fault

lies in the fact that British industry is not "providing the environment for managerial development." He believes that EDP staffs should be selected for possible management careers, and that there must be a planned program of career development to go with the EDP jobs. He is of the opinion that without such a promise of opportunity, EDP staffers may tend to enlarge their jobs to the point of controlling information, to the detriment of a balanced and humane management.

AUTOMATIC TEACHING: THE STATE OF THE ART

Eugene Galanter, editor
Published by John Wiley & Sons, Inc. $3.25

These are some of the papers which were read at the conference on the Art and Science of the Automatic Teaching of Verbal and Symbolic Skills, hosted by the Air Force of Scientific Research and the University of Pennsylvania in December 1958. They are concerned with the experimental study of teaching by automatic means, from specially designed textbooks to computers. The papers have been published to stimulate research in this new field.

Two of the most interesting and comprehensible papers (for a layman) are concerned with "intrinsic programming," and a method of teaching binary arithmetic on an IBM 650 computer. "Intrinsic programming" is the name given to the sequencing of information, questions, and answers in a text book. The student reads a question on the subject, then selects one of a group of suggested answers, and turns to the page reference given opposite his selection. If his answer is wrong, the information on the page referred to explains why the answer is incorrect, and suggests he select another answer. When the student selects the correct answer, its referenced page will contain the answer along with the reasons, and another question which leads the student forward to the next step.

PRELIMINARY STUDIES IN AUTOMATED TEACHING

R. F. Mager, U.S. Army Air Defense, Ft. Bliss, Texas
IRE TRANSACTIONS, June 1959; pages 104-107.

More teachers and schools and better facilities and materials will not lead to better teaching and more efficient learning if the teacher does not know his subject matter, is unable to make efficient use of aids, or fails to apply principles of learning.

"Efficient learning is realized to the extent that behavioral laws are applied to the teaching-learning environment.... but, in the classroom environment as we know it, not only does the teacher not structure the situation in accordance with the state of the art, but effective application of learning principles appears impossible."

For example, it is impossible "to apply the principle of knowledge of results, since a single instructor cannot give each student corrective information for each response he makes. It is impossible to apply the principle of reward... since a single instructor cannot selectively provide appropriate feedback to each student in the class upon the execution of a correct response. Further, since such feedback must be provided immediately to be effective, it is clear that still another principle, that relating to the immediacy of reinforcement, remains unapplied."

It is suggested that the entire learning situation needs to be reexamined, and remolded into a form which incorporates these learning principles. Experimentation has shown that automated teaching devices may be an answer. Descriptions of three studies of automated teaching methods are described: the Skinner method (a simplified problem and answer progression), the Crowder method (known as the "scrambled book" method) ((both of these are described in "Automatic Teaching")), and an experiment which compared the results of the two methods.

The need for automated teaching methods in training electronics maintenance technicians is discussed. To do this machines and methods must be developed. Some of these needs are:

1. Research equipment to allow testing proposed methods of programing, which provides for acceptance and recording of different kinds of learner responses.
2. A device that can be used for self-testing and review purposes.
3. A device that will provide for variable-speed drill in rote memorization.
4. A device to provide personnel with updated information (perhaps a pocket-size teaching machine with its program on film in cartridge form).

Engineers are urged to hasten the arrival of automated teaching. Engineering instructors should program subject matter in the manner of Skinner, Crowder, or others, and try them on their students. Engineers should develop the required hardware, such as those suggested above. And organizations, such as the IRE, should support research and development in the automated teaching field.

HEURISTIC PROGRAMS, COMPUTER SIMULATION, AND HIGHER MENTAL PROCESSES

Walter R. Reitman, Carnegie Institute of Technology, Pittsburgh, Pa.
BEHAVIORAL SCIENCE, October 1959; pages 330-335.

The important work of Newell, Shaw, and Simon, in the development of heuristic computer programs, is reviewed in this article. Heuristic programs are concerned with simulating the higher mental

processes of humans--thinking and problem solving. The emphasis of the research in this field is on the heuristic program, and not upon the computer. A three-point contrast with "conventional" computer programs helps to clarify the characteristics of heuristic programs:

1. Conventional programs are possible only when the problem is known and a solution procedure can be specified, step by step. Heuristic programs, on the other hand, discover solutions--including testing to determine whether any of the solutions attempted fully satisfies the requirements of the problem.
2. Conventional programs generally manipulate numbers arithmetically. Heuristic programs are designed to handle non-numeric symbols.
3. Conventional programs, being step by step prescriptions, guarantee solutions. Heuristic programs can make no such guarantee.

Answer-seeking for problems that may be unanswerable

The heuristically programmed computer is closer to a human problem solver than to a conventionally programmed machine. Neither human nor heuristically programmed computer need be guaranteed beforehand that any given method will work, or that a solution exists at all. Both proceed by searching for "likely possibilities" and then trying them out. With heuristic programs, the computers solve problems by processes which in humans would be called hunches, judgments, inferences and insights.

At what level of subject matter complexity do heuristic programming approaches become inapplicable? There would seem to be no meaningful answer to this question possible at this point. Even in the case of an activity as complex as novel writing, for example, much of the overall program structure would seem to be inferable for instances where adequate protocol materials, notebooks, diaries, and drafts are available.

On accomplishments to date, only a logic problem program has had extensive computer tests. The program proves a considerable number of theorems, including one proof considerably more elegant and direct than that described in Whitehead and Russell's Principia Mathematica (1925) from which the original theorem was taken. This fact makes it reasonable to wonder whether we should not even now grant the heuristically programmed computer a measure of "creativity."

EXECUTIVE CONTROL & DATA PROCESSING

Lowell H. Hattery, American University, Washington, D.C.
Published by Anderson Kramer Associates. 1959. $3.95.

Automatic data processing is one of the tools of executive control. However, as the author says in his preface, "it is unrealistic to treat [it], important though it is, out of the context of the execu-

tive role and the total management information process." This book looks at management from the standpoint of its obligations and its need for information, and then shows how automatic data processing can aid in management functions. Detailed outlines are given of management decision-making requirements, of report requirements, and of administrative organizations which are conducive to good executive reporting and data handling. The management aspects of investigating and preparing for automatic data processing are thoroughly covered. In all, the book gives management its first exclusively-management look at electronic data processing and reporting. This is one of the first books the executive should read when he begins to suspect his decision-making is based on inadequate reporting.

THE COMPUTER JOURNAL

The October 1959 issue of THE COMPUTER JOURNAL, the publication of the British Computer Society, is devoted to the papers of the Society's first conference, in June, 1959. These include several papers on The State of the Art, an order processing application in a tobacco manufacturing company, the use of a computer in municipal data processing, a symposium on the selection and training of programers, a paper on automatic programing, a production control application, and some experiences in the use of magnetic tapes. The material is similar to what has appeared in the U. S. in the past year, and will not add greatly to the knowledge of the American computer field. However, the proceedings give a good general view of the field in Britain, and will be of value to businesses there who are planning on EDP installations now or in the near future.

THE COMMERCIAL USE OF COMPUTERS IN BRITAIN

R. H. Williams, Computer Consultants Ltd.
AUTOMATIC DATA PROCESSING, November 1959; pages 33-35.

The author's firm recently made a survey of every user of commercially manufactured computers which have been installed in Britain as well as every foreign user of British-built computers. It was found that 69 commercial (i. e. for business uses) computing systems are installed in Britain, eleven of which make use of magnetic tape. This includes 16 service centers. Of the 53 installations on the users' own premises, most of them have been the result of the user company's own efforts. The exceptions, which appear to be the most successful installations, include a user who previously used time at a computing center, a user who had his system designed and installed by a manufacturer's systems adviser, another by an independent Organization and Method team within the user company, and another by a combined team from within the organization and a government department.

Conclusions reached by the firm making the survey are: 1) although it is essential to know what work one wishes to do and to know the business thoroughly, it is not always wise to try to plan a computer installation wholly from within the organization; and 2) the installation of a system will take about two years from date of ordering. The original plans should aim at an effective scheduled time of 95 percent, and efforts should be made to increase this to 99 percent in operation.

HANDBOOK OF AUTOMATION, COMPUTATION, AND CONTROL, VOL. II

Edited by Grabbe, Ramo, Wooldridge
Published by John Wiley & Sons, Inc., New York $17.50

The second of the comprehensive set of three handbooks is now available. Volume 1 published earlier this year, dealt with control fundamentals: general mathematics, numerical analysis, operations research, information theory and transmission, and feedback control. Volume 3, as yet unpublished, will deal with systems engineering, manufacturing and chemical process control, servo components, etc.

Volume 2 will probably be of the most interest to people interested in data processing, although systems engineers in the future will certainly be interested in all three volumes. Volume 2 deals with computers and data processing, and covers the subjects in an excellent manner. Major section headings include: computer terminology, digital computer programming, use of digital computers and data processors, design of digital computers, design and application of analog computers, and unusual computer systems. Over forty people contributed to the writing and editing of this volume.

Programing, coding, and applications are well covered

Chapter 2, on programming and coding, was written by John W. Carr III. The 269 pages in this chapter give a good coverage of the subject, including much material on automatic programming. Chapters 3 through 11 should be of particular interest to people desiring more information on data processing applications, since they cover such subjects as basic operations (data collection, conversion, etc.), quantitative characteristics, equipment descriptions, and various types of applications.

Chapters 12 through 20 deal with the design of digital computers, including such topics as components and basic circuits, logical design, input-output equipment, storage, and so on. The remainder of the book is concerned with analog machines and such special machines as combined analog-digital computing systems.

This volume will serve as an excellent reference in the subject of data processing. Persons who have felt the need of a book that ties together data processing applications, systems engineering fundamentals, and a good, readable description of equipment will find that this volume meets those needs very well.

DATA PROCESSING, 1959 PROCEEDINGS OF NMAA

Published by National Machine Accountants Association. $10.00

For the second year the NMAA has published its annual conference proceedings in an attractive book, easy to manage, and in a good, readable type face. There are 46 papers, besides the opening remarks of General Leslie R. Groves. These cover many areas of data processing both in punched card operations, and in large computer installations. To choose a few at random: Quality Control in Data Processing, Centralized versus Decentralized Machine Accounting, Conversions, EDP in a Metropolitan Police Department, Pipe Line Accounting, Planning New Applications, Progress in the Data Processing Industry. Inasmuch as this will probably be most useful as a reference book, it might be helpful to include an index in future editions.

STUDY OF EDP FOR STATE AND LOCAL GOVERNMENTS

The Rand Corporation is making a study of data processing for state and local governments in California, the purpose of which, based on an analysis of data used for decision making and record-keeping, is to formulate a system to more effectively prepare, process, and present data, and to employ new management concepts in governmental functions. ((From a news release.))

MAKERS, INDEPENDENTS JOIN COMPUTER CENTER SCRAMBLE

CONTROL ENGINEERING, November 1959; page 54.

The newest plans for computing centers are those of CEIR (Corporation for Economic and Industrial Research) and Minneapolis-Honeywell. CEIR will establish IBM 7090 centers in New York, Houston, and Washington, and others later in Chicago, and Los Angeles. M-H's Datamatic Division will place its Honeywell 800 in New York, Boston, Chicago, Los Angeles, and Washington. National Cash Register will open NCR 304 centers in New York and Dayton, Ohio. Philco is contemplating such a move but has not announced any plans.

AUTOMATION ANSWERS

AUDITGRAM, December 1959; page 37.

A new monthly column appears in this issue. The column answers questions about automation in banking. Answers are written by NABAC's Automation Committee.

The first column begins a question and answer discussion of account numbering and coding systems; most of the information presented has been well covered in recent issues of DPD ((see March 1959, page 11; April 1959, page 13; November 1959, page 3; December 1959, page 9)).

MAINTENANCE METHODS FOR DIGITAL COMPUTERS

Fred Liguori, Sperry Gyroscope Co., Marine Div., Syosset, L.I., N.Y.
COMPUTERS AND AUTOMATION, December 1959; pages 20-24.

The advantages and disadvantages of methods of computer maintenance are discussed. These methods are: permanently stored test programs, test programs in temporary storage, and manual testing procedures. ((The article appears to be of general interest to those companies which contemplate purchasing a computer and performing their own maintenance.))

STEEL OPENS THREE DOORS TO AUTOMATIC DATA PROCESSING

R. M. Sills, G. E. Terwilliger, General Electric Co.
CONTROL ENGINEERING, December 1959; pages 99-104.

The steel industry is beginning to use automatic data processing equipment in three ways: production information handling, collection and analysis of test data on process dynamics, and overall improvement of operation economies, such as accounting and quality control.

COMPUTER TAKES ON COLOR FOR MARKET APPEAL

INDUSTRIAL DESIGN, November 1959; pages 52-55.

In this critique of the RCA 501, the industrial designer's part in computer design is emphasized. The designers used color to identify stationary units as opposed to movable units. Color is used functionally on the control console in such a way that it adds to the total visual design. However, the critic believes that much of the design of the system appears to be applied, rather than integral, the console's panel being an outstanding exception.

Applications

NAVAL SUPPLY CENTER, NORFOLK, VIRGINIA

The Norfolk Naval Supply Center serves bases and fleets in the Atlantic and Mediterranean Oceans, as well as other Naval groups and NATO allies in distant parts of the world. In an average month the Center receives more than 200,000 request documents and ships out over 145,000 measurement tons of supplies and equipment.

Recently, a Burroughs 220 computing system was installed as the data handling control in this vast distribution system. The 220 will determine availability of items requested for shipment, create shipping invoices and update stock and financial records. It will also provide integrated personnel accounting and print reports to facilitate executive decisions.

Exception reporting is by-product of processing

During the processing run the computer will check all input data against regulations which govern the handling of given transactions. When it finds an exception condition, the computer will print an exception notification card, which will be sent to stock analysts for immediate attention.

Routine print-out will be in the form of invoices with attached issue data cards. Where possible, these will be produced in material location sequence. When warehouse and delivery action has been taken, the issue data cards will be returned to the Requisition Control Branch and filed as proof of delivery.

A telephone inquiry station located in the computing center accepts queries about stock availability. The operators hand the queries to a Flexowriter operator who prepares a punched tape which is then read by a photoreader. This equipment signals the central computer that it has an inquiry. The computer accepts the inquiry, searches for the answer and transmits the answer to the Flowriter. The typed answer is then handed to the telephone operator who delivers the message to the inquirer. This entire process takes an average of about 73 seconds. ((From a news release.))

HOW RAILROADS USE COMPUTERS

RAILWAY AGE, December 7, 1959; pages 14, 15.

Some examples of the use of computers by railroads are given. A western railroad provides complete weight information at one of its iron ore docks to advise the shipper (mining company) how much of a required grade of ore is on hand at the docks. This enables the shipper to quickly make up any deficiencies in an order, reducing ship waiting time.

A midwestern railroad has automated its purchasing and inventory operations to provide a perpetual record of the amount of money the company owes for materials and supplies purchased, delivered or due for delivery, and automatically prepares vouchers and drafts on dates due.

Two eastern railroads made a joint market study, using a computer, of shipments from a medium-size city. Another railroad uses a computer to simulate single track operation. The information derived is useful in planning track and signal layouts for CTC. An eastern road uses a digital computer to calculate train performance, fuel or electrical energy consumption, and locomotive tonnage ratings. A western road has used a computer for obtaining information on better distribution of empty box cars.

Programing

COBOL—COMMON BUSINESS ORIENTED LANGUAGE

Last May, the Department of Defense called a meeting of computer industry representatives to initiate the formation of uniform programing procedures for the government computer systems. Three committees were formed: Short Range, Intermediate Range ((see DPD, November 1959, page 11: "Common Language for Data Processing Systems")), and Long Range.

The Short Range Committee's work was to be accomplished by the end of 1959. The result of their work is COBOL, "Common Business-Oriented Language." The new source language will permit programers to communicate instructions to the computer in words, statements, sentences, and paragraphs in meaningful English. Specific COBOL compilers written for various computers will then translate these instructions into appropriate machine language object programs. For more complete information, write to chairman of the Short Range Committee: J. H. Wegstein, U. S. Bureau of Standards, Washington, D. C. ((From a news release.))

Management Sciences

UTILITIES GET NEW WAY TO PLAN

BUSINESS WEEK, November 28, 1959; pages 101-104.

Westinghouse Electric Corp. has developed a long-range planning technique called Powercasting which combines game theory with the high-speed calculating ability of a computer. For the utility company it can simulate many power usage situations rapidly and economically, allowing the company to compare numerous alternatives, andit can be updated and corrected for actual experience quite readily.

Westinghouse is offering Powercasting to the industry at large, with the only cost involved being computer time in Westinghouse's computer lab. This is part of an overall long-range program undertaken by Westinghouse to enlarge its market for electrical equipment (see "Calling the Shots for the 1980s," page 86, same issue of BUSINESS WEEK).

Equipment

CONTROL DATA'S LARGE-SCALE 1604 COMPUTER

MANAGEMENT AND BUSINESS AUTOMATION, December 1959; page 37.

The first production model of Control Data Corporation's 1604 computer will be delivered to the U. S. Navy Postgraduate School at Monterey, California. The 1604 can be used for large volume commercial and scientific problems as well as defense systems control. Its related 1605 Adapter enables it to use standard input-output equipment manufactured by other companies. The computer is modular in construction, and transistorized, with a magnetic core storage of 32, 768 words of 48 bits each.

A complete system can be installed in a room 20 feet square. Room air conditioning is recommended, but no special ducting is required. Input-output operations are carried out independently of the main computer program, by means of an automatic program cycle which buffers data to and from the computer memory.

SPEAKING OF SMALL COMPUTERS

DATAMATION, November-December, 1959; pages 7-9.

A comparison is made of the Royal McBee LGP-30, the Bendix G-15, the Autonetics Recomp, and the new IBM 1620, including a table of characteristics and a photograph of each machine.

UNIVAC SOLID-STATE 80/90 MAGNETIC TAPE SYSTEM

This new Univac general purpose computing system can be ordered for either 80- or 90-column punched card input (hence the name). It has a 5000-word magnetic drum storage, and the system is composed of the Tape Synchronizer with up to ten magnetic tape handling units, the High-Speed Reader, the Central Processor, the Read-Punch Unit, and the High-Speed Printer. ((From a news release.))

IBM 1620 DATA PROCESSING SYSTEM

This is a small, transistorized scientific computer, particularly adaptable to such problems as highway cut-and-fill, bridge design, oil pipeline transmission, petroleum blend evaluation, etc. It has a 20,000 digit core memory with variable field length. Specific programs for the petroleum industry, public utilities, civil engineering, and optical firms will be available. The system will rent for $1600 a month, and sell for $74,500. ((From a news release.))

ROYAL PRECISION RPC-4000

Royal Precision Corporation will market its new RPC-4000 computer through its Royal McBee Corporation, with deliveries scheduled to begin next July. The RPC-4000 will rent for $1750 per month, with total price of $87,500. The computer is a small, fully transistorized computer for both scientific and business applications. The memory capacity is 8008 words which can be searched for full or partial words through a special masking feature, at a rate of nearly 200,000 words a minute. Up to 17 input-output devices may be connected on-line with the basic system. This may be increased to 60 with minor modification. Standard input-output equipment is a tape typewriter system. Basic reader speed is 60 characters per second, basic punch speed is 30 characters per second. A reversible

photo electric reader which reads punch-paper tape at 500 characters per second and a high speed punch at 300 characters per second are available as optional accessories. Peripheral equipment to be made available in 1961 includes a magnetic tape drum and line printer. ((From a news release.))

SPEC COMPUTER

The SPEC, manufactured by Computer Control Company, is a small digital computer designed specifically as a useful laboratory and classroom tool. By the use of plugboards, it may be transformed from a general purpose computer to a digital differential analyzer containing 128 words of fast access internal storage. For further information, write to: Computer Control Company, Inc., Western Division, 2251 Barry Avenue, Los Angeles 64, California. ((From a news release.))

A NEW DATA PROCESSING SYSTEM

AUTOMATIC DATA PROCESSING, November 1959; pages 16, 48.

The KDP. 10 is a fully transistorized computer manufactured by the English Electric Company and based on a design by Radio Corporation of America (RCA). Information can be transferred at the speed of 33, 333 characters per second. The high speed random access magnetic core storage can be expanded to provide 16, 000 to 260, 000 characters. The KDP. 10 can perform a wide variety of operations simultaneously. ((Apparently the computer bears a strong resemblance to the RCA 501.))

BRITISH COMMERCIAL COMPUTER DIGEST

This digest is a survey of the computer products of twenty-four manufacturers which are currently available in Britain. The digest gives availability, selling prices, rentals, cost of shipping and installation, cost of spare parts, general characteristics, and number of units installed to date. An updating service is included. Cost is £3. 3. 0. For information, write to: Computer Consultants Ltd., Cecil Court, London Road, Enfield, Middlesex, England.

Comment

AUTOMATIC TEACHING

In this issue, pages 7 and 8, we reviewed an interesting little book and an article on the subject of automatic teaching,[1] and it might be valuable to review the state of this art based on these and on other articles reviewed in DPD. As will be observed, automatic teaching is beginning to get into the field of electronic digital computers.

Automatic teaching implies the use of machines to aid or directly perform the function of teaching human beings. The subjects being taught vary widely, from elementary school subjects to motor skills to complex problem-solving techniques.

The elements of automatic teaching

Teaching systems which incorporate teaching machines generally consist of most of the following elements[1]:

1. A rule or set of rules guide the student's responses, imparted either by "live" lectures, recorded lectures, or incorporated with the question and answer material.

2. A set of stimuli or questions is presented, each of which calls for a response from the student. Generally these questions are organized so as to lead the student through a large number of steps which are carefully designed to minimize the probability of an incorrect answer (note this carefully, more about it below). Also, the steps generally proceed from simple, concrete ideas to more complex, abstract ideas.

3. In general, the student must respond to each question--he may not "do nothing." Also, a large number of questions, and responses, is involved causing active student participation.

4. The program permits one or more acceptable responses to each question, with which the student's response is compared. A controversy exists in the field here on free choice versus multiple choice--making the student volunteer an answer versus giving him a list to select from.

"Free choice" poses a problem in feedback

5. In general, there is an immediate feedback to the student as to whether his answer was correct or not--and here is where the controversy gets interesting. The "free choice" people obviously have a problem on their hands--how, in a machine short of a big computer, can you carry all of the acceptable responses for all of the questions, for automatic comparison? Thus the "free choice" people seem to favor the "large number of steps carefully designed to minimize probability of an error" mentioned in (2) above--the concept

of open loop control. On the other hand, much interesting work is being done with feedback, which implies a more limited number of acceptable responses. In one interesting experiment performed at IBM using a 650, when an incorrect answer occurs, the machine signals WRONG to the student and then presents the student with another problem whose difficulty is a function of the number of errors that the student has made in that part of the teaching program.

Computer controls answer

6. In most teaching machines, the student can set his own pace in answering the questions (or in giving the response). And in some machines, he can also determine when he wants the machine to give him the next question, after satisfactorily completing the previous one.

7. Often, too, the machine incorporates performance recording, to show the number of right and wrong answers by the student.

Interestingly, automatic teaching may change our concepts of school classes and grades. The teaching machine allows each student to proceed at his own pace, without being retarded or advanced too rapidly by his fellow students. Also, since each student will eventually complete each set of questions, marks may change their meaning and may simply indicate how far through a given set the student has progressed at the time of report cards.

Several broad classes of subject matter have been identified with teaching machines:

A. Facts, rules, identifications, etc. which often can be learned "in isolation" from the total task.

B. Short and intermediate sequences of procedures which can be memorized. We might include some motor skills like typing in this category; some work in England has been interesting here[2] wherein one hour of training on a key punch training device is said to be equal to three hours of conventional training.

Complex problem-solving by machine

C. Lengthy sequences of procedures which generally require reference to manuals, check lists, etc.

D. Concepts: what a system is trying to do and how it is trying to do it--though generally this material is taught by lectures.

E. Complex problem solving, involving deciding on the cause of the problem and what action to take. Interesting work has been done in the Air Force on this problem, as reported in the book and the article reviewed in this issue. Also of interest here is research in machine learning[3, 4, 5, 6] wherein computers are programmed to learn to solve complex problems. As we learn more about effective rules of machine

learning and heuristic problem solving, we should know more about improving teaching machines.

Yes, the subject of automatic teaching certainly seems to be getting into the area of electronic computers. If you are interested in learning more about the subject, we can't think of a better place to get more information than from the book AUTOMATIC TEACHING.

REFERENCES:

1. AUTOMATIC TEACHING, John Wiley & Sons, 1959, edited by Eugene Galanter; DPD, February, 1960, p. 7.
2. "A Machine that Learns from Experience," DPD, June 1959, p. 10.
3. "Some Studies in Machine Learning Using the Game of Checkers," DPD, September 1959, p. 11.
4. "Machines Are Smarter Than I Am!" DPD, October 1959, p. 18-20.
5. Newell, A., and H. A. Simon, "The Simulation of Human Thought," RAND Corp. paper P-1734, June 22, 1959; also see related paper in OPERATIONS RESEARCH, Jan-Feb 1958, pages 1-10.
6. "Heuristic Programs, Computer Simulation, and Higher Mental Processes," DPD, February 1960, p. 8.
7. "Preliminary Studies in Automated Teaching," DPD, February 1960, p. 7.

Training

Operations Research Courses, sponsored by American Management Association:

Application of Operations Research Techniques to Inventory Control
Date: February 8-10, 1960

Operations Research Techniques - I: Data Organization and Simplified Solution Techniques
Date: February 29 - March 4, 1960

Operations Research - Explained with Applications
Date: March 2-4, 1960

Place: New York City (Hotel Astor) for all courses
Information: Mr. S. Charles Bleich, American Management Association, 1515 Broadway, Times Square, New York 36, New York

"Introduction to Computers and Programing Techniques," course offered by Department of Industrial Engineering, University of Southern California, Spring Semester, beginning February 8, 1960. Class meets Tuesday evenings 7:00-9:40 P. M. For information, write to Mr. Seymour Porter, Department of Industrial Engineering, University of Southern California, Los Angeles.

New Concepts in Planning and Installing Electronic Data Processing
Sponsored by United Services Automobile Association

Date: April 4-8, 1960
Place: United Services Automobile Assn. Building, San Antonio, Texas
Instructor: Mr. Richard G. Canning
Fee: $250.00
Information: Colonel A. T. Leonard, Vice President, United Services Automobile Assn., U. S. A. A. Building, San Antonio, Texas

University of Michigan Summer Courses, 1960, a program of intensive non-credit courses for practicing engineers and scientists including electronic data processing.

Dates: June 13-24, 1960
Place: Ann Arbor, Michigan
Information: R. E. Carroll, Coordinator, Engineering Summer Courses, 2038 East Engineering Building, The University of Michigan, Ann Arbor, Michigan

Engineering Executive Program

Date: September 1960 (Deadline for applications, March 1, 1960)
Place: University of California at Los Angeles
Program: Master's Degree program for engineers who will fill top executive positions in industry. The program will stress the evaluation function and the decision making function of the executive.
Fee: $350.00 for each semester
Information: Engineering, Room 4073C Engineering Building, Unit I; University of California, Los Angeles 24, California

Meetings

Second Retail Research Institute EDP Conference, sponsored by and for NRMA members.

Date: February 8-12, 1960
Place: San Francisco, California (St. Francis Hotel)
Fee: $100 (includes four luncheons)
Content: Automation in the retail industry, with additional information about EDP in banking, insurance, and aviation
Information: Miss Ethel Langtry, Research Director, Retail Research Institute, NRMA, 100 W. 31st Street, New York 1, New York

SHARE XIV Meeting

Date: February 15-19, 1960
Place: Statler Hilton Hotel, Los Angeles, California
Information: Jerry Koory, System Development Corp., Santa Monica, Calif.

American Institute of Industrial Engineers, Detroit Chapter Conference, "The Practical Approach to Industrial Engineering."

Date: February 18, 19, 1960
Place: Detroit, Michigan (Statler Hilton Hotel)
Information: Mr. Harry Pierce, Chrysler Corporation, Highland Park Plant, Highland Park 31, Michigan

Univac Users Association
Date: February 25, 26, 1960
Place: White Sulphur Springs, W. Va. (Greenbrier Hotel)

AMA Sixth Annual Data Processing Conference
Date: February 29 - March 2, 1960
Place: New York City (Statler-Hilton Hotel)
Information: American Management Association, Inc., 1515 Broadway, Time Square, New York 36, New York

IRE National Convention
Date: March 21-24, 1960
Place: Coliseum and Waldorf Astoria Hotel, New York, New York

Fourth Annual Symposium on Recent Advances in Programming Methods, conducted by the Central Ohio Association for Computing Machinery
Date: March 26, 1960
Place: Ohio State University, Columbus, Ohio
Information: R. K. Kissinger, Publicity Chairman
c/o Nationwide Insurance Companies
246 North High Street, Columbus, Ohio

TIMS-ORSA West Coast Meeting
Date: April 7, 8, 1960
Place: Monterey, California (U.S. Naval Postgraduate School)
Information: Daniel Teichroew, Stanford University, Stanford, California

Western Joint Computer Conference
Date: May 2-6, 1960
Place: San Francisco, California

Insurance Accounting and Statistical Association Annual Conference and Business Show
Date: May 15-18, 1960
Place: Chicago, Illinois (Sherman Hotel)

Conference on Automatic Computing and Data Processing in Australia, sponsored by the Australian National Committee on Computation and Automatic Control
Date: May 24-27, 1960
Place: University of Sydney and University of New South Wales
Information: C. H. D. Harper, Secretary, Australian National Committee on Computation and Automatic Control, c/o The Institution of Engineers, Science House, 157 Gloucester Street, Sydney, Australia

Automatic Computing and Data Processing in Australia, Conference sponsored by The Australian National Committee on Computation and Automatic Control
Date: May 24-27, 1960
Place: Sydney (University of Sydney and University of New South Wales)
Information: C. H. D. Harper, c/o The Institution of Engineers, Science House, 157 Gloucester Street, Sydney, N. S. W., Australia

National Machine Accountants Association National Conference

Date: June 22-24, 1960

Place: San Francisco, California

Program: On Tuesday, June 21, a pre-conference tour will be conducted to outstanding data processing centers in nearby areas. In addition to the regular meetings, a Hall of Discussions will be held during the conference which will feature questions of general interest discussed informally. Following the conference, registrants may continue to Honolulu for a two-day meeting beginning on Monday, June 27, featuring data processing experts from the Pacific Basin and Asia.

Information: Address inquiries to 1960 National Conference, NMAA, P. O. Box 3617, Rincon Annex, San Francisco 19, California

National ACM Conference

Date: August 23-25, 1960

Place: Marquette University, Milwaukee, Wisconsin

SHARE XV Meeting

Date: September 12-16, 1960

Place: Pittsburgh, Pa. (Pittsburgh Hilton Hotel)

Information: E. B. Weinberger, Gulf Research & Development Co., Drawer 2038, Pittsburgh 30, Pa.

References

DATA PROCESSING DIGEST does not provide copies of the original material digested or reviewed in this issue. The publishers addresses are listed below for your convenience in writing to them for more complete information.

Anderson Kramer Associates
1722 H Street NW
Washington 6, D. C.

Armed Forces Comptroller
516 North Oxford Street
Arlington 3, Virginia

Auditgram
38 South Dearborn Street
Chicago 3, Illinois

Automatic Data Processing
Mercury House
109-119 Waterloo Rd.
London SE 1, England

Banking
12 East 36th Street
New York 16, New York

Behavioral Science
Mental Health Research Institute
University of Michigan
Ann Arbor, Michigan

Business Week
330 West 42nd Street
New York 36, New York

The Computer Journal
The British Computer Society Ltd.
Finsbury Court, Finsbury Pavement
London EC 2, England

Computers and Automation
815 Washington Street
Newtonville 60, Mass.

Computing News
Box 261
Thousand Oaks, California

Control Engineering
330 West 42nd Street
New York 36, New York

Credit & Financial Management
229 Fourth Avenue
New York 3, New York

DataMation
10373 West Pico Blvd.
Los Angeles 64, California

Industrial Design
18 East 50th Street
New York 22, New York

Internal Auditor
120 Wall Street
New York 5, New York

Transactions of I. R. E.
1 East 79th Street
New York, New York

Management & Business Automation
600 West Jackson Blvd.
Chicago 6, Illinois

National Machine Accountants Association
1700 West Central Road
Mt. Prospect, Illinois

Railway Age
30 Church Street
New York 7, New York

Stores
100 West 31st Street
New York 1, New York

John Wiley & Sons, Inc.
440 Fourth Avenue
New York 16, New York

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